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bart
impact
program

THE PROVISION AND USE OF THE BART FACILITIES FOR DISABLED PERSONS



working paper

The BART Impact Program is a comprehensive, policy-oriented study and evaluation of the impacts of the San Francisco Bay Area's new rapid transit system (BART).

The program is being conducted by the Metropolitan Transportation Commission, a nine-county regional agency established by state law in 1970.

The program is financed by the U.S. Department of Transportation, the U.S. Department of Housing and Urban Development, and the California Department of Transportation. Management of the Federally funded portion of the program is vested in the U.S. Department of Transportation.

The BART Impact Program covers the entire range of potential rapid transit impacts, including impacts on traffic flow, travel behavior, land use and urban development, the environment, the regional economy, social institutions and life styles, and public policy. The incidence of these impacts on population groups, local areas, and economic sectors will be measured and analyzed. The benefits of BART, and their distribution, will be weighed against the negative impacts and costs of the system in an objective evaluation of the contribution that the rapid transit investment makes toward meeting the needs and objectives of this metropolitan area and all of its people.

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THE PROVISION AND USE OF THE
BART FACILITIES FOR DISABLED PERSONS



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WORKING PAPER

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16. Abstract This report summarizes the results of several studies of the BART facilities for disabled persons. It includes a history of the provision of the facilities, a description of them and of BART plans to modify and expand them, and suggestions by disabled persons for their improvement. Interviews with disabled persons are reported to indicate the problems they have experienced in using BART and the impact the facilities have produced on their travel behavior.			
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SAN FRANCISCO BAY REGION CENTRAL AREA

BART: The Bay Area Rapid Transit System

Length:	The 71-mile system includes 20 miles of subway, 24 miles on elevated structures and 27 miles at ground level. The subway sections are in San Francisco, Berkeley, downtown Oakland, the Berkeley Hills Tunnel and the Transbay Tube.
Stations:	The 34 stations include 13 elevated, 14 subway and 7 at ground level. They are spaced at an average distance of 2.1 miles: stations in the downtowns are less than $\frac{1}{2}$ -mile apart while those in suburban areas are 2 to 4 miles apart. Parking lots at 23 stations have a total of 19,000 spaces. There is a fee (25 cents) at only one of the parking lots. BART and local agencies provide bus service to all stations.
Trains:	Trains are from 4 to 10 cars long. Each car is 70 feet long and has 72 seats. Top speed is 80 mph with an average speed of 38 mph including station stops. All trains stop at all stations on the route.
Automation:	Trains are automatically controlled by the central computer at BART headquarters. A train operator on-board each train can over-ride automatic controls in an emergency.
	Magnetically encoded tickets with values up to \$20 are issued by vending machines. Automated fare gates at each station compute the appropriate fare and deduct it from the ticket value. At least one agent is present at each station to assist patrons.
Fares:	Fares range from 25 cents to \$1.45, depending upon trip length. Discount fares are available for the physically handicapped, children 12 and under and persons 65 and over.
Service:	BART serves the counties of Alameda, Contra Costa and San Francisco, which have a combined population of 2.4 million. The system was opened in five stages, from September, 1972, to September, 1974. The last section to open was the Transbay Tube linking Oakland and the East Bay with San Francisco and the West Bay.
	Routes are identified by the terminal stations: Daly City in the West Bay, Richmond, Concord and Fremont in the East Bay. Trains operate every 12 minutes during the daytime on three routes: Concord — Daly City, Fremont — Daly City, Richmond — Fremont. This results in 6-minute train frequencies in San Francisco, downtown Oakland and the Fremont line where routes converge. In the evening, trains are dispatched every 20 minutes on only the Richmond — Fremont and Concord — Daly City routes. Service is provided weekdays only, between 6 A.M. and midnight. Future service will include a Richmond — Daly City route and weekend service. Trains will operate every 6 minutes on all routes during the peak periods of travel.
Patronage:	Approximately 130,000 one-way trips are made each day. 200,000 trips are anticipated under full service conditions.
Cost:	BART construction and equipment cost \$1.6 billion, financed primarily from local funds: \$942 million from bonds being repaid by the property and sales taxes in the three counties, \$176 million from toll revenues of transbay bridges, \$315 million from federal grants, and \$186 million from interest earnings and other sources.

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TABLE OF CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENTS	i
SUMMARY	1
ORGANIZATION	1
OBJECTIVES AND LIMITATIONS	3
PART I: A HISTORY OF THE DECISIONS TO PROVIDE FACILITIES FOR DISABLED PERSONS ON BART	5
The Early Decisions	5
The Implementation Process	10
PART II: A DESCRIPTION AND ASSESSMENT OF THE BART FACILITIES FOR DISABLED PERSONS	12
The Planning Process	12
Information About BART	12
Getting to the Station	14
Station Layouts	14
Fares and Ticketing	16
Remotely-Attended Stations	17
Guides and Instructions	18
Vertical Access	19
Escalators	19
Elevators:	
Locations	19
Signs	20
Malfunctions	20
Modifications	21
Platform Edges	22
The Train-to-Platform Gap	22
The Train Ride	23
Security	24
System Performance	25
Emergency Provisions	25
Measures of the Use of BART	26
Summary	30
Implications	33

TABLE OF CONTENTS
(continued)

	<u>Page</u>
REFERENCES	35
APPENDIX I: The San Francisco Bay Area Rapid Transit Facilities For the Elderly and the Handicapped, by Harold Willson	A-1
APPENDIX II: Annotated Bibliography of Studies Summarized for this Report	A-10

ACKNOWLEDGEMENTS

This report summarizes the results of the following studies which were conducted for the BART Impact Program by its consultants and contractors:

BART and the Handicapped, by Robert Levine

Document # WP17-1-75 prepared by MTC for the U.S. Department of Transportation. Berkeley, California; November, 1974.

Community Monitoring, by Curtis Associates & Gruen Associates

Document # WP22-4-76 prepared for the BART Impact Program. Berkeley, California; March, 1976.

Environmental Impacts of BART: The User's Experience, by

De Leuw Cather & Co. & Gruen Associates, Document No. DOT-BIP-TM 23-4-77, in publication, prepared for the BART Impact Program. Berkeley, California; November, 1976.

"Special Group Mobility Survey and Analysis," by Jefferson Associates in conjunction with the Center for Independent Living, prepared for the BART Impact Program. Berkeley, California; November, 1975 (unpublished).

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THE PROVISION AND USE OF THE BART FACILITIES FOR DISABLED PERSONS

SUMMARY

BART, the Bay Area Rapid Transit System, was the first public transit system in the country designed to serve disabled persons, including persons in wheelchairs. Stations throughout BART are equipped with elevators, ramps, curb cuts and special communications systems. These facilities are the result of a campaign by disabled persons for a barrier-free BART system. They were planned before Federal or State guidelines had been adopted for them, and before the feasibility and desirability of serving disabled persons on mass transit facilities had been demonstrated.

The BART experience documented in this report includes descriptions of the BART facilities, accounts of users' experiences with them, and a history of the decisions which led to their provision. It is intended to serve as a source of information for transit planners in other urban areas.

Two general principles for the design of barrier-free public transit can be derived from the BART experience. First, plans for the full range of facilities for disabled persons should be made early in the process of designing a rail transit system to ensure that they will be uniformly provided and conveniently located throughout the system. At BART the facilities were added step-by-step throughout the design and construction of the system. As a result they are located inconveniently in some stations, and procedures for their use can cause delays for disabled persons who travel on BART. The costs which BART incurred, estimated to be between \$8½ and \$10 million, are higher than they would have been if the facilities had been planned before stations were designed.

Second, the BART experience demonstrates that disabled persons should be included in the planning process for any new transit system. They can provide valuable advice and they can assure that the many needs of the heterogeneous group of disabled persons who will be patrons of the system are all considered.

ORGANIZATION

In Part I of this report the history of the decisions to provide access facilities for disabled persons is documented.

Part II includes a description of the BART facilities and of the current BART planning process for modifying them. It also includes detailed suggestions for the design of specific facilities, and counts of the use of BART elevators.

The Appendices of the report provide background material. Appendix I is an account by Harold Willson of his efforts to secure facilities for disabled persons on BART. As a representative of the Easter Seal Society, Mr. Willson was the single person most influential in securing the access facilities.

Appendix II is an annotated list of the studies on which this report is based.

OBJECTIVES AND LIMITATIONS

This report has been prepared as part of a comprehensive, policy-oriented study and evaluation of the impacts of BART which is being conducted by the Metropolitan Transportation Commission, the regional transportation planning agency for the 9-County Bay Area. It is intended as a description and evaluation of the BART service for disabled persons. Its purpose is to assist transit planners elsewhere in their efforts to provide service for persons with physical disabilities.

A definitive evaluation of the impacts of the BART service on the travel behavior and quality of life of disabled persons is not included in this for a number of reasons which are discussed below.

- (1) The BART service is relatively new. BART revenue operations began on one line in the East Bay in 1972. The last link of the system, the Transbay tube, was opened for service in September, 1974. Service was limited to the weekday daytime hours of 6 a.m. - 8 p.m. until November, 1975, when the hours were extended to midnight. Saturday and Sunday service have not yet been provided.

At the present time BART service is provided on three routes, one in the East Bay only and two Transbay. In the future service will be provided on a third Transbay route between Richmond and Daly City, week-end service will be provided, and train frequencies will be increased from the present 12-minute intervals to trains every 6 minutes.

This report reflects evaluations made within one or two years after the opening of the full 71-mile BART system and before BART service had reached planned levels. The period of time between the provision of a new means of mobility for disabled persons and the realization of the full extent of its benefits can be expected to be lengthy. The use of a new facility often requires changes in habits and in the range of interests and activities which create needs for mobility. A lowering of physical barriers to mobility is only one step in increasing the mobility of disabled persons.* Therefore, until the full range of BART services

*See AC Transit Elderly and Handicapped Planning Study prepared by Crain & Associates, Menlo Park, California, July, 1977. Unemployment, under-employment and early retirement were found to be the major reasons disabled persons travel less than able-bodied persons. However difficulties with transit functions were more important impediments to travel than labor force status for the most severely disabled persons. (p. 57)

has been provided and the use of the system is no longer a novelty to disabled persons an attempt to evaluate the full extent of its impacts would be inappropriate.

- (2) The BART system was not operating with a high degree of reliability when the observations on which this study is based were made. Frequent malfunctions of vehicles and train control equipment, as well as of ancillary equipment such as fare gates, ticket machines, and public address systems, resulted in frustrating delays and long waits for trains. The system could not be relied upon for persons who had to arrive at a destination on schedule. BART reliability is improving, but a considerable length of time may be required before the system is considered to be sufficiently reliable to meet the needs of many potential patrons.
- (3) The use of BART often entailed additional frustrations and delays for some disabled persons because equipment necessary for their trips, such as elevators and communications systems, malfunctioned very frequently during the period when observations were made for this report. A discussion of these problems is provided in Part I.

The obstacles to travel mentioned above are one set of limitations to the findings reported in this study. A second type of limitation concerns the nature of the data gathered from surveys. None of the surveys represent random samples or representative groups of disabled persons in the BART service area. The difficulties of contacting a truly representative group are largely due to the isolation of many disabled persons. The disabled persons participating in surveys are generally relatively active and mobile. For this reason, the results of interviews and surveys cited in this report are intended to be suggestive and descriptive rather than quantitative representations.

PART I: A HISTORY OF THE DECISIONS TO PROVIDE FACILITIES FOR DISABLED PERSONS ON BART

The Early Decisions

Ramps, elevators, curb cuts, wide gates and parking spaces reserved for handicapped persons are now a part of the BART system. New communication systems, warning strips around obstructions, and textured platform edges are all being planned for BART. These facilities are the results of efforts by disabled persons, their supporters, and the BART staff to create a barrier-free transportation system for persons with a wide variety of disabilities, including persons in wheelchairs.

Access facilities were first proposed for BART early in the 1960's when many persons who were members of minority groups, including physically disabled persons, were beginning to attempt the removal of the social, economic, legal, and physical barriers which stood in the way of the full use of their capabilities.

"We learned from the Black movement," recalls Phil Draper of Berkeley's center for disabled persons, the Center for Independent Living. That lesson is apparent in a motto adopted by Harold Willson, a vocal representative of handicapped persons, "Segregated facilities are inadequate."

New drugs and medical innovations were important catalysts for change for disabled persons during the 1960's. Antibiotic drugs, which had first been used in the United States in 1938, were keeping persons with severe disabilities alive and in reasonably good health for the first time in history. New therapies, new prosthetic devices, and motorized wheelchairs extended the boundaries of independence and self-sufficiency for handicapped and elderly persons. Persons with physical disabilities banded together in associations, clubs, and societies in sufficient numbers to begin to demand that their needs be served. One of the first, most pressing needs was for increased mobility to widen the range of daily choices and to make normal work, recreation, and social activities possible. The goal was the removal of architectural barriers to the mobility of physically handicapped persons.

Expectations of transit systems also changed during the 1960's. Once seen as private, profit-making enterprises, public transit systems in the 1960's could no longer be sustained by fare-box revenues. Transportation began to be publicly subsidized and to be regarded as a public service, one with an obligation to serve the entire community including its physically disabled members. The

new attitudes toward the role of transit systems and the new expectations on the part of disabled persons coincided with the planning and building of BART. The result was an expansion of BART's role beyond that foreseen by its early planners.

Funding for BART's construction was authorized by Bay Area voters in 1962. In that same year Harold Willson, a representative of the Easter Seal Society's Architectural Barriers Committee, began his long and fruitful efforts to secure provisions for disabled persons on the system. Willson, who was in a wheelchair, contacted the BART staff to acquaint them with the standards for the design of public facilities which had recently been adopted by the American Standards Association (ASA). The standards were voluntary but they provided detailed specifications for facilities to serve elderly and handicapped persons.

By 1964 Willson had achieved a degree of success. He had made the BART staff well aware of the needs of disabled persons for service on public transit systems. The staff had begun to consult with him and with several other persons who were knowledgeable about disabled persons' needs. Willson had been invited to comment on the BART plans for design specifications, and he found a number of features which would permit the system to be used by some disabled persons. For instance, level loading between platforms and trains and escalators for all vertical distances of 12' or more would permit many disabled persons to board the trains. Additionally, BART planned at that time to provide a seat for every passenger, a feature which would assure a comfortable ride for elderly and semi-ambulatory patrons.*

Whenever possible within budget constraints, and wherever the requirements appeared reasonable to BART engineers, ASA standards were added to the official BART design standards which were adopted by the District in 1965. The BART standards conformed to ASA provisions in terms of the width of gates and doors; in requirements for non-slip floor and stair treads; in specifications for stair widths, risers, handrails and ramps; and in the provisions for changes in floor texture at the ends of stairways. (Ref. 1, p. 9)

*BART goals no longer include the provision of seating space for every passenger. The provision of seats for approximately 78% of patrons on trains during peak travel hours is now considered to be an economically efficient service standard.

However, two of Willson's major suggestions which were necessary for service to persons in wheelchairs were not adopted in 1965. Elevators were not included in station designs, and restrooms were not to be designed to accommodate wheelchairs. The BART District clearly stated its intent to serve handicapped persons, but not those in wheelchairs, in its Manual of Architectural Standards. Section 1.7D of the manual reads: "Normal circulation through the BART system should be planned so that handicapped persons, except those in wheelchairs, can move easily to their destination." (Ref. 1, p. 10)

The reasoning which led to the decision to exclude persons in wheelchairs from access to BART is illustrated in the following exchange of ideas which took place in 1965, between a BART design engineer and an engineer from the consulting firm of Parsons, Brinkerhoff, Tudor, and Bechtel (PBTB). (Ref. 1, p. 12)

"The means of facilitating all of these (the various categories of handicapped persons, including non-ambulatory persons in wheelchairs) may not be economically justified, no matter how 'inhuman' this may appear," BART's engineer stated. The PBTB engineer agreed: "More than thirty stations located in three counties and in fifteen communities would have to be designed with wheelchairs in mind at every turn," he said. He foresaw that if access for wheelchairs were provided, "no halfway measures will suffice...once in and they must be allowed to go to their destination, so at every turn there must be special provisions, at each station and on every train. Their problems are not known since they are not accommodated on existing systems and they do not ride transit vehicles."

This conversation illustrates the dilemma of early engineers and planners who had no guidelines to follow and no experience from the operations of other transit systems to show the extent of the provisions which would be necessary if disabled persons were to be served. In the view of the BART engineers at that time the system would provide a pioneering public service by serving the many disabled persons who were not in wheelchairs. Semi-ambulatory persons, those with coordination difficulties, and aged persons would all be able to use BART. The BART engineers used figures from a recently-completed National Health Survey to show that BART would serve 99% of the public without incorporating elevators into the design: only persons confined to their homes, to institutions, or to wheelchairs would be excluded from the system.

Willson argued the issue: "All of the surveys and counts ... are irrelevant to the barrier-free environment issue, and... tend to promote programs that isolate the elderly and handicapped into high-cost facilities and segregated, inadequate transportation systems," he maintained. He pointed to the fact that life spans were increasing, old persons frequently suffered physical limitations, and that the possibility was increasingly great that any person would become handicapped at some point, temporarily or permanently, during the course of a lifetime. He countered concerns expressed by staff members that wheelchair-bound patrons would be helpless in the event of a disaster, unable to navigate the narrow walkways in tunnels and on aerial structures, by labelling them "over-protective, mothering attitudes." "Handicapped persons will gladly take the risk in exchange for mobility," he said. (Ref. 1, p.14)

Nevertheless, elevators were ruled out of consideration. The most potent argument against them was their cost. By 1966 the BART District was short of funds to complete the basic system. The provision of elevators was out of the question at a time when funds were not available to provide for facilities already planned. Platform screens (screens at platform edges which would open to admit patrons to trains) were another potential aid to handicapped persons which were dropped from consideration at that time. They had been planned as a safety measure which would have been particularly helpful to blind persons.

However, Harold Willson continued to advocate that elevators be provided. He became a frequent speaker to groups of disabled persons and to social, political and religious groups throughout the Bay Area. His theme was the need for provisions for disabled persons, including persons in wheelchairs, on the new BART system. His efforts resulted in correspondence to the BART Board of Directors and its staff from a wide variety of public and private groups. They all requested that BART provide elevators or moving ramps, accessible restrooms and wide parking stalls throughout the system.

By 1968 the dozens of letters from rehabilitation agencies, disabled persons and groups, doctors, councils of churches, boards of supervisors and city councils had a substantial influence on the BART Board of Directors. At that time the Board recommended the inclusion of elevators in the BART system

in principle. Implementation of the recommendation depended on receipt of funds from a source outside BART. Moreover, the Board stipulated that such funds must be above and beyond those needed to complete construction of the basic system as it had been designed.

Once the principle that elevators should be included in BART was established, Harold Willson and his supporters carried their campaign to the California State Legislature. There a request had been made by BART for additional funding to complete the basic system and to provide elevators for disabled persons.

The BART request was timely because a separate but complementary campaign was being waged in Sacramento for legislation requiring the inclusion of ASA design specifications not only in BART designs, but also in those for all newly-constructed public facilities. The victory came in 1968, with the passage of a statute which read:

"Blind persons...and other physically disabled persons shall be entitled to full and equal access, as other members of the general public, to the accommodations, advantages, facilities, and privileges of all common carriers..." (Ref. 1, p. 18)

The legislation established the legal right of blind and handicapped persons to use public facilities, and was passed on the heels of another landmark bill, AB 7, signed by the Governor in June, 1968, which detailed the specific parts of the ASA specifications which were required to be followed in the design of public facilities.

The most significant aspects of the new legislation for BART were the requirements that elevators be included in stations and that restrooms be redesigned to accommodate persons in wheelchairs. A number of minor requirements, such as those specifying the details of the grading of public walks and the provision of handrails, also affected BART.

The requirements posed serious problems at BART. Funds continued to be short; moreover, many station designs had been completed and construction had begun for a few. Compliance with the legislation required additional funds, beyond those needed to complete the basic system. Willson, the BART officials, and their supporters continued to petition the legislature for assistance.

Meanwhile the political pressures directed to BART increased, particularly those from disabled persons who sought public support for the inclusion of elevators. A colorful illustration of their efforts and one of the earliest instances of the use of direct-action tactics by disabled persons is a demonstration which took place in March, 1968. An ad hoc committee, the

Committee for the Freedom of Mobility of the Disabled, organized a demonstration by disabled persons in Berkeley. A fleet of wheelchairs accompanied by persons using crutches and carrying canes converged on the downtown construction site of the Berkeley BART station. Work was halted by the demonstration for one morning, and the press gave wide coverage to the demonstration. As a result public awareness of the issue was increased.

The many-sided efforts resulted in a victory in 1969, when the State Legislature voted \$150 million in additional funding for BART. A sum of \$7 million of that total was earmarked for elevators and accessible restrooms in BART stations to serve patrons in wheelchairs.

Each barrier removed in the effort to provide full access to disabled persons revealed a new range of problems. In 1969, only three months after funding had been provided, BART's major contractor recommended that the Board reconsider its decision to include elevators in all stations. The engineers told the Board that the installation of elevators in every station was impractical in view of the District's overall financial picture. On the basis of this assessment of the situation the Board voted to eliminate elevators in ten specific stations.

When advocates of the elevators became aware that the project was jeopardized they objected vehemently. City councils of many communities passed formal resolutions recommending that elevators be included in all stations, and occasionally accusing the BART Board of making an illegal decision in view of the expressed intent of the Legislature. The City of Berkeley prepared a suit against BART on these grounds. Mayor Wallace Johnson of Berkeley, a leader of the advocates of elevators, was also a member of the BART Board of Directors at that time. He used both positions for a campaign for elevators in all stations. The Alameda County Central Labor Council added its voice, along with senior citizens centers, the Board of Supervisors of Alameda County, disabled individuals, clubs, societies, doctors, social workers and lawyers. On September 11, 1969, the Board reconsidered its decision and directed that elevators be installed in every BART station.

The Implementation Process

Compliance with the law was assured, but the story of BART and its provisions for disabled persons was not ended. The decision to make the system accessible meant the fulfillment of the prophecy that disabled persons must be accommodated "at every turn." BART staff discovered that each addition to the system had to be considered from the point of view of the disabled persons. Additionally, decision to provide elevators initiated an extended period of negotiations with local communities for

space for elevator entrances. Planning for elevators in downtown stations in Oakland proved the most difficult. Oakland officials refused to relinquish sidewalk space, making it necessary to secure the permission from private property owners in the neighborhood. An elevator from street mezzanine in the Oakland Twelfth St. Station was not available for six years after the Board's decision as a result of the difficulty in securing sidewalk space.

However, by August 1973, when three of BART's four lines were in operation most stations and their elevators and other facilities for disabled persons had been built. Harold Willson and a delegation of the Paralyzed Veterans of America toured the system with the BART Director of Installations, Wilmot McCutchen. The group inspected stations and trains and found a dozen minor adjustments which were needed to assure compliance with the law. Once the work was completed, substantial compliance with the law was achieved.

The provision of the facilities to permit access to BART for persons in wheelchairs was a breakthrough in the design of public transportation. However, it did not automatically result in a dramatic increase in mobility among the Bay Area's disabled residents. Many problems remained, and many matters affecting the use of access facilities were not covered by the legislation. The quality and extent of BART's service to handicapped persons are matters for a continuing series of decisions, as the continuing modifications described in Part II demonstrate.

PART II: A DESCRIPTION AND ASSESSMENT OF THE BART FACILITIES FOR DISABLED PERSONS

This chapter begins with a description of the institutional context in which current planning for access for disabled persons takes place at BART. A comprehensive account of the journey on BART for disabled persons follows, with descriptions of the facilities for disabled persons and of plans for modifications to them.

The Planning Process

Plans to serve disabled persons on public transportation are most effective if they are based on detailed knowledge about the wide range and complex variety of physical disabilities which impede mobility. An understanding of the transportation needs entailed by each type of disability is also important. BART instituted an effective process for planning modifications to access facilities by organizing a Task Force on Handicapped Access. The Task Force includes representatives of disabled persons' organizations, social service agency personnel, and staff members from several BART administrative and operating departments. The Task Force was formally instituted in 1974 after many years of formal and informal consultations between BART staff and disabled persons. It performs planning and advisory functions. The Task Force has no direct power to allocate BART capital improvement funds, but it sets priorities within the framework of funds available for access facilities. It also serves as a two-way channel of communications between BART staff and disabled persons throughout the Bay Area.

The Task Force is a valuable resource for BART. A similarly organized group is recommended for any transit agency which serves, or is planning to provide service for disabled persons.

Information About BART

The first need of disabled persons who are potential transit patrons is for information about the system, its special facilities, and the specific ways in which it can be useful to them. Information is particularly important to explain a complex system such as BART, where the ticketing process, the location of elevators and trains, and the identification of station locations and routes can be confusing to many first-time users, able-bodied and disabled alike. Disabled patrons have more potential problems than able-bodied patrons. Some of them have difficulty communicating their questions and understanding answers. Some are not accustomed to using public facilities. Then many unfamiliar features and procedures which they encounter in using a modern rail rapid transit system can appear to disabled persons to be formidable barriers to its use.

Early BART efforts to produce information specifically for disabled persons consisted mainly of publication of a brochure which described the system in general and provisions such as elevators for disabled persons. In addition, from time to time groups of disabled persons were escorted through the system to provide them with first-hand experience in using BART facilities.

The inadequacy of the information provided disabled persons was emphasized by several disabled persons who were interviewed as part of the BART Impact Program's studies. The interviewees mentioned that they did not know BART was equipped to serve persons with severe disabilities, or that they had not been given sufficient information to enable them to use BART with confidence.

The BART Task Force has acknowledged the need for better information, and several steps have recently been taken to provide it.

- (1) A new brochure has been designed with information for disabled persons. The brochure includes detailed instructions for travel on BART for persons with a variety of disabilities. It is scheduled to be available in BART stations and in the offices of agencies and organizations concerned with disabled persons by the end of 1977.
- (2) Special provisions for communication with deaf persons have been made in the telephone information centers at BART. Two Port-A-Printer machines (teletype machines which print copies of messages sent through telephone connections) have been installed. Deaf persons who have access to similar equipment can inquire about BART service and receive printed replies.
- (3) Information about the status of elevators is provided to the system's telephone information center, as well as to BART station agents. Arrangements have been made to enable on-line personnel to receive up-to-the-minute reports of any elevators which are out of service. This is an important service for disabled persons, many of whom know from past experience that elevators frequently malfunction. The BART staff can inform a person planning a trip whether the elevators are functioning in the origin and destination stations to be used.

The BART experience clearly demonstrates the importance of good information for disabled persons to tell them about the availability of public transit and its provisions for their specific needs. Because many disabled persons are isolated they are difficult to reach. Therefore the assistance of social service agencies and organizations of disabled persons is useful in disseminating information. This is an example of one way in which organizations can help disabled persons fully utilize provisions for their travel on public transportation.

Getting to the Station

BART is only one element in the Bay Area transportation network. It is necessary to use an automobile, bus or van, or to walk or roll in a wheelchair to get to and from BART stations. All BART parking lots have wide, reserved parking spaces near station entrances for the use of disabled persons. Curb cuts and ramps are provided for level access throughout the system. However, the environment outside the BART system is not yet designed for the access of persons in wheelchairs, or for semi-ambulatory persons. Public buses are not yet equipped with special lifts for wheelchairs, for instance. Nor are they designed for the comfort, safety, and convenience of persons who have difficulty walking, climbing steps, or standing in a moving vehicle. Curb cuts or curb ramps are provided in a few central city areas and throughout the city of Berkeley. Elsewhere curbs are generally insurmountable barriers for independent travel by disabled persons. Additionally, a person in a wheelchair can roll only as far as the distance a battery-powered wheelchair can go without being recharged -- about five miles.

Buses with access facilities have recently been designed and tested and major Bay Area bus agencies are currently considering ways of serving disabled persons. When feeder services to stations are improved, and when improvements in bus facilities for disabled persons are made, the benefits of the BART provisions will be more readily available to disabled persons.

Station Layouts

The 34 BART stations were designed by 16 different architects and architectural firms. BART's early planners encouraged diversity in design to avoid monotony and to enable planners to design stations which harmonize with their surroundings.

The results have generally been esthetically pleasant. However, for disabled persons, especially those who are blind, the resulting unique pattern of passenger flow in each station has been a source of confusion.

BART stations were described by a blind patron who was interviewed as indeterminate expanses of space. They have no textured paths and few audible signals except the sound of fare gates and ticket machines to suggest the direction of travel. The assistance of a station agent is necessary for first-time blind users and for many experienced patrons. (Ref. 1, p.26)

Blind patrons have also mentioned that telephone kiosks and the backs of elevators and stairways are obstructions to their movement through stations. The problem is being solved at BART by the installation of warning devices such as railings and bumper blocks around such obstructions. Some of the warnings have been installed, and all are scheduled to be provided by the middle of 1978.

Semi-ambulatory persons have other complaints arising from the layout of BART stations. For them a trip on BART sometimes entails long walks through stations from entrances through fare gates to elevators, escalators, or stairways, and onto trains. The problem is partially due to the size of some stations, especially central city subway stations where mezzanine areas are two or three blocks long. Difficulties caused by station size are compounded by a lack of maps, signs, and clearly marked pathways to enable patrons to use the stations efficiently and to minimize the distance within them to be traveled. The distance to be traveled to find station agents by persons needing their assistance further complicates the trip. Station agent booths are generally located in several places in large stations. However, during off-peak periods of travel an agent is generally on duty in only one of the booths. A disabled person needing assistance must go to the booth where an agent is on duty in order to process a ticket, use a special service entrance gate, or to get information. Unless such a person has entered a station near a staffed booth a long trip may be necessary to find the agent.

Disabled persons interviewed had a number of suggestions for ways to alleviate some of their problems in large BART stations. The most frequent suggestion was for more and better maps, signs and instructions. A map of the station layout displayed at each station entrance was considered a good plan to assist disabled persons' trips on BART. The same kind of map on the platform level would assist patrons alighting from

trains to find their way to the exit. Blind patrons approved the idea of such maps particularly if they could be provided in bas-relief. Blind patrons also suggested that stations include a textured path from the station entrance through faregates to stairways and platform locations.

An additional suggestion concerned the problem of locating a station agent in a large station. Disabled persons suggested that intercom systems be placed at all fare gate locations so that persons with ambulatory disabilities could request that a station agent come to their assistance. The prospect of a long, difficult and tiring walk through a station has discouraged some semi-ambulatory persons from making full use of the BART system. (Ref. 1 and 2).

The BART Task Force has initiated a project to help make station layout information more readily available. Maps of station layouts are being produced which will be given to all station agents and to telephone information center personnel. The maps will show the location of all facilities and will indicate the best travel path through stations for disabled persons. On-line BART personnel will be able to direct a patron to the most efficient pathway in both the station of origin and the station of destination for a trip. The maps will be a catalogue of all existing facilities, and as such will serve as a tool for planning uniform and comprehensive facility modifications.

The suggestions which disabled persons have made to assist their movement through the BART stations demonstrate the benefits to be gained from consulting with them when planning accessibility facilities. Their sensitivity to features of design and operation make them a valuable source of ideas for planning facilities for everyone.

Fares and Ticketing

Federal regulations requiring that disabled persons be given a fare discount on public transit systems receiving Federal financial assistance prompted the BART Task Force to begin working with representatives of Bay Area bus agencies to develop a discount fare program. The program provides a 75% discount for disabled BART patrons who establish eligibility under guidelines established by the program. Each disabled patron receives an identification card which is honored by all major Bay Area transit agencies. BART discount tickets are sold at banks in the Bay Area. Disabled persons can purchase a \$6 BART ticket for \$1.50. The discount program has been in effect since July, 1975, and approximately 15,000 discount cards have been issued to persons in the Bay Area for

use on BART and on bus systems in a 7-county area. Persons eligible for the discount include those with physical, mental, and emotional disabilities. Discount tickets are sold at banks in the BART service area rather than in stations.

Disabled persons who have attempted to use the ticket vending machines in BART stations commented that the procedure can be difficult for persons without full use of hands and arms, and for persons with vision problems. For instance, dollar bills must be inserted with the correct side up and the correct edge forward or the machines will not accept them. However, the push-pull motions required by the automated fare equipment are generally easier for disabled persons than lifting or twisting motions.

Station agents are a vital link in the trip on BART for disabled persons who cannot use the vending equipment, or who cannot walk through the faregates. Service gates near the agents' booths permit the entry of persons in wheelchairs. Generally, the gates must be opened by the station agent, who processes tickets for disabled persons who need assistance.

Remotely Attended Stations

The importance of a station agent to disabled persons on BART is illustrated in the foregoing description of the ticketing process. Agents are also important for general orientation to the system, and in some stations an elevator can be summoned only by a station agent. For these reasons, disabled persons have protested a recent BART decision to operate several stations by remote attendance when week-end service begins in January, 1978. However, the BART Task Force has been invited to play an active role in planning for the change to assure that disabled persons can continue to use the system. Several preliminary changes in station operation have been planned, and the planning process is continuing. For instance, the stations will be modified to include additional closed-circuit TV coverage of station areas. Service gates will be adjusted to be operable by disabled persons. Additionally, changes in ticketing procedures and in elevator operations are being designed.

If remote attendance can provide efficient, safe and convenient service for disabled persons it is possible that their ability to travel independently may be enhanced. If so, the automated arrangements being planned by BART will be useful examples of arrangements which enhance the ability of disabled persons to travel independently on public transit.

Guides and Instructions

Disabled persons who have been interviewed have indicated general approval of the design of the BART communication system which includes maps, instructional brochures and signs, announcements from station agents, train operators, and central control personnel, and track-side signs which flash announcements of the destinations of arriving trains. However, they have voiced major complaints about gaps in the information and about the lack of information for blind persons. Complete information should be available in both auditory and visual form at each stage of a journey and it should be reliable and intelligible to meet disabled persons needs. On-train announcements about station arrivals have been cited as the least reliable, least intelligible aspect of BART communications. Public address systems in BART vehicles are often out of order, and some train operators do not routinely announce station stops. Blind patrons who regularly travel on the same BART route have reported that they attempt to count the station stops between their origin and their destination, but that this is a difficult procedure on very long trips partially because of unscheduled stops between stations. (Ref. 2, p. v-12)

One aspect of the BART communication system which has been designed specifically to enable it to be used by disabled persons is the telephone system. One public telephone in each BART station area has been placed to be within reach of disabled persons in wheelchairs. Intra-station courtesy phones, which are used to contact a station agent, are placed sufficiently low to enable disabled patrons to use them. Interviewees mentioned, however, that telephones can be used only by persons who can use their hands and arms, and who can speak and hear reasonably well. Intercom systems activated by push buttons are easier for some disabled persons to use. The Task Force has planned an intercom test program to determine the feasibility of replacing BART courtesy telephones with push-button systems in all stations.

Vertical Access

Stairs, escalators, and elevators are included in all BART stations. Generally, they are adequate for most disabled persons' travels. However, design and operational problems with escalators and elevators have limited their effectiveness.

Escalators

Escalators are generally well-placed and well-marked. The major problem disabled persons have experienced with them is the lack of signs indicating whether an escalator is moving in an upward or downward direction. The direction of movement of many of the escalators is changed throughout the day to correspond with the dominant direction of passenger flow. As a result a patron cannot determine which way any given escalator is moving without observing its motion. Semi-ambulatory patrons report many unnecessarily long walks in BART stations to find an escalator moving in the desired direction. For most able-bodied patrons the problem is trivial. For semi-ambulatory patrons for whom walking is tiring and difficult it is an important problem. It remains to be solved at BART, and it is one transit planners elsewhere should consider when vertical access is being planned.

Elevator Locations

Elevators are poorly located in out-of-the-way places in many BART stations, as a direct result of their inclusion in the system after the designs for many stations were complete and after construction was underway in some stations. They were located within stations for the purpose of minimizing the necessity for re-design and reconstruction rather than for the convenience of patrons. As a result they are not in the paths of patron movement and their use requires long trips through the stations. For instance, in one BART station the elevator entrance is in a parking lot; in another it is in a vestibule across the street from the main station entrance. Patrons must often travel back and forth to buy and process tickets and to use the elevators. Long, time-consuming trips are often required in multi-level BART stations also because two separate elevators must be used, one from the street to the mezzanine level, and one from the mezzanine to the platform level.

Problems arising from the location of BART elevators are excellent examples of the need for early and comprehensive planning of access facilities. In BART stations which were originally designed to include elevators, the elevators are generally well located. For instance, the large multi-level Embarcadero subway station in downtown San Francisco was planned and constructed after the decision had been made to include elevators in all BART stations. In that station the elevators were placed near the faregates and station agent booths, and in the center of the

long platform. In suburban elevated stations also, the elevators are generally well located because the stations are very compact and because many of them were constructed after the decision to include elevators had been made.

Elevator Signs

There are no signs in BART stations to indicate the location of elevators. Such signs were deliberately omitted when the stations were built in an effort to make the elevator locations inconspicuous. It was hoped that this would discourage criminal activities, and that only persons with genuine needs for the elevators would take the trouble to locate them.

However, the result has been a total lack of knowledge of the existence of the elevators on the part of some disabled persons. Others have reported long, tiring walks along station platforms in search of elevators. Therefore a decision was made by the BART staff in 1974 to provide signs showing elevator locations in all stations. Unfortunately, the signs have not yet been provided because funds were never made available. However, the signs are currently included among the funded projects which are scheduled to be completed by mid-1978.

It should be noted that the effort to keep the elevators crime-free has been largely successful. Elevators have not been the sites of crimes against persons, nor have they been used for the evasion of fare payments. The latter use was feared because many BART elevators move between "free" areas open to the public and "paid" areas accessible only to persons who have paid a fare. Whether the elevators will become less safe and secure when they are made more visible remains to be seen. Precautions such as closed-circuit TV monitoring are seen by the BART staff and the Task Force as sufficient protection to assure the continuing safety of the elevators.

Elevator Malfunctions

Elevators are not only poorly located in many BART stations, but their performance has been poor. Interviews and studies indicate that elevator malfunctions have been so frequent and so severe that their use by disabled persons has been adversely affected. Not only do malfunctions cause frustrations and delays, but some persons interviewed indicated a fear of being trapped in them. One person's description of a situation in which the elevator did not work provides a sense of the experience: "I couldn't tell if it was moving. The phone was in the corner and inaccessible...there is no communication once you're in there. You feel trapped; it's aesthetically unpleasant, steel and shiny." (Ref. 2, p. V-10)

Elevator performance has been poor because the special BART elevators were designed with many provisions for safety and for operations by station agents in anticipation of their use by disabled patrons. However, until early 1977 the high degree of maintenance necessary to keep the intricately designed circuitry in good working order was not provided. Currently, however, efforts are being made to provide the maintenance resources necessary to keep them functioning reliably. A primary source of trouble has been the pressure-sensitive floor pads which were designed to detect an occupant in an elevator and to then signal the elevator to move. The floor pads were not sufficiently sturdy to carry the heavy loads required. They have been re-designed and the newly installed pads are expected to give better service.

The BART elevators also include electronic eyes and pressure-sensitive door edges, and they are programmed for "dwell" times sufficient to permit a wheelchair-bound patron to enter and position the chair. A BART elevator patron needs only to summon the elevator (by contacting a station agent via telephone or intercom), board it, and wait to be taken to the next level of the station; absolutely no action is required on the part of the occupant to cause the elevator to move. Elevators are programmed to work in a cycle, which takes them from their programmed "home base", (often between the floors of a station), to the floor to which they are summoned, then to the destination, and back to the base position.

Every one of the specially designed elevator features has caused some maintenance and operating problems. Electronic eyes are frequently vandalized, as are telephones and intercom buttons, particularly those on the street level of subway stations. Emergency telephones and alarms inside elevators sometimes do not work, for a variety of reasons. An elevator boarded in the middle of a cycle has occasionally taken its occupant to the base position between floors rather than to the destination. If such a person is so severely handicapped that sounding an alarm or summoning an agent is difficult, the occupant may be trapped until the situation is discovered.

Elevator Modifications

The need for well-functioning, reliable elevators and the difficulty of obtaining such performance from the intricately designed elevators such as those in BART stations is evident from BART's experience. Elevator problems have been a

primary concern of the BART Task Force. As a result, elevator maintenance procedures at BART have been revised. The BART personnel have taken complete responsibility for elevator maintenance rather than delegating it to the elevator manufacturers. Two full-time maintenance workers have been assigned to the task, each for an 8-hour shift. Regular preventive maintenance was made an on-going procedure, and station agents were assigned the task of regularly testing elevators each morning before the stations are opened. As a result, within 3 months of the implementation of the new procedures, "trouble" calls about the elevators had been reduced from an average of 4 to 6 each day to 2 to 3 each week.

Many problems with the BART elevators have either been ameliorated by recent BART actions or are being studied in an effort to find solutions. Elevator malfunctions have been a major complaint of disabled persons who have used BART. Therefore, an improvement in their performance is an important step toward dispelling the anxieties many disabled persons have about the BART system.

Platform Edges

Blind persons who use BART report that there is no warning to them about platform edges in most stations. They consider a good warning system to exist at a few stations, in the form of a change in texture in the floor material near the edge of the platforms. They suggest that railings at the platform edge would also be helpful. The railings would have openings at locations for train boardings, and they would be helpful to blind persons as indications of the place to stand to board a train, as well as safety devices. Blind BART patrons point out that color changes or slight texture changes at platform edges do not constitute adequate warnings for them. The Task Force has requested that good texture changes be provided at all BART platform edges when capital improvement funds become available for this project.

The Train-to-Platform Gap

A rail transit system necessarily operates with some distance between the train and the platform edge. At BART, the dis-

tance is generally 2" - 3" although occasionally when the vehicle balance mechanism is not functioning properly the distance is greater. Occasionally, interviewees report, wheelchair wheels have caught in the gap. They also report that it is possible to cross the gap safely but that the process generally requires training. The danger of being caught is mitigated by the fact that the train will not move if a train door is open. A wheelchair caught in the gap will generally block the train door and prevent it from closing, as will a person's body. However, BART trains have very infrequently started when a patron's foot or leg has been caught in the gap and when the door was not blocked. The situation can be dangerous and the problem is difficult to solve, since a gap is necessary to operations. A retractable lip between the platform and the train door has occasionally been suggested as a solution. It is undoubtedly an expensive solution, particularly for a transit system which is built and operating. There is doubt among BART engineers that a retractable lip could be made to operate reliably. The problem of the "gap" is one example of problems remaining to be solved by transit system engineers and planners working with disabled persons.

The Train Ride

Generally the ride on BART is smooth and comfortable for both disabled and able bodied patrons. However, semi-ambulatory persons and those with coordination problems have reported having difficulty in maintaining their balance when trains accelerate and decelerate rapidly. The provision of additional stanchions and safety straps was suggested by semi-ambulatory persons as one way to ameliorate this problem. This solution produces a conflict between the need for many stanchions and grab rails or straps within easy reach of all patrons and the need to avoid creating hazards to patrons' movements through the vehicle. This problem is an additional illustration of the need for consultation with disabled persons during the design process so that a balance between competing needs can be sought.

Patrons in wheelchairs report that their chairs roll around or lurch when trains start and stop. The BART staff has suggested that positioning wheelchairs sideways to the direction of train movement helps to keep them steady. Persons in wheelchairs have suggested that wheelchair lockdown devices be provided in the trains. This suggestion has been rejected by the Task Force, whose guidelines for any new facility require that disabled persons be able to use it without assistance. A wheelchair lock-down can only be used by disabled persons who can use their hands and arms, or who travel with an attendant. On the other hand, if an attendant is present a lock-down device is unnecessary because the attendant can steady the wheelchair brakes and use a stanchion in the vehicle for additional support. Such patrons do not need wheelchair lock-downs. For these reasons the Task Force does not consider lock-downs, as presently designed, to be useful devices in transit vehicles.

A number of BART patrons in wheelchairs expressed dissatisfaction with the space provided for wheelchairs in the vehicles, which is in the vestibule areas by train doors. They fear being in the way of other patrons, especially during rush hours. This is an additional problem which remains to be solved by planners and disabled persons.

Security

Early BART planners were alert to the need to provide a secure environment for all patrons, including those who are disabled and elderly. They provided good lighting and open station designs. BART stations have very few out-of-the way places which might encourage criminal activities. Closed circuit television cameras are located on station platforms and at elevator entrances to provide surveillance by station agents from their booths. Elevators are activated by station agents, as described earlier, to discourage criminal activities. As an additional security measure restrooms in stations can be opened only by station agents, who admit only one patron at a time. The patron locks the restroom from the inside.

The rate of crimes against persons on the BART system has been very low, either as a result of these provisions or because a majority of BART patrons or commuters to work are a group of persons with a generally low crime rate, or because of a combination of these and other undetermined factors. Disabled persons who were interviewed did not express fears for their safety from criminal activities.

System Performance

The unreliability of BART's operations causes problems for all patrons. The problems are greatest for those disabled persons for whom alternative public transportation is not available. "When people cannot use other transportation they absolutely depend on BART to function", one disabled person said. Others expressed anxiety about being trapped and helpless if an accident should occur. Many reported feeling that they were trapped by problems resulting from malfunctions. Evidence from interviews with disabled persons who do not ride BART suggests that their anxieties about such matters may discourage some of them from using the system.

The comments of disabled persons about the effects of BART's lack of reliability show that many of them have mixed evaluations of the system's operations. On the one hand, using BART sometimes results in their late arrival at work, school or for appointments. The malfunctions sometimes cause anxiety. On the other hand, some trips are made possible for them which were not possible before BART service began, and some trips are easier for them to make on BART than by any other mode of travel. "To go to San Francisco is much easier... I go and visit friends more", and, "I'm doing the same things, but my feelings are changed with respect to how much I'm willing to depend on others for rides now", are comments made by some disabled persons who were interviewed.

Emergency Provisions

The presence of physically disabled persons on the BART system has been one factor pointing to the need for staff training in methods to meet emergency needs for all patrons. Personnel training programs are now underway at BART to train the staff to meet needs arising from illnesses such as epilepsy and to provide competent assistance for persons in wheelchairs and those who are blind.

Measures of the Use of BART

Counts of the use of BART elevators and of the number of trips in elevators by persons in wheelchairs are shown on the following page. They indicate that both utilization of the elevators and the number of trips made by persons in wheelchairs increased faster than BART patronage as a whole between November, 1975 and February, 1977. Over-all patronage increased about 6% during this period while both the number of elevator trips and the number of trips by persons in wheelchairs increased about 42%. About one trip in every 3,700 on BART was made by a person in a wheelchair in February, 1977. This was an increase over the rate in November, 1975, when one trip was made in a wheelchair for every 4,500 trips on the system.

There were several changes in BART service between 1975 and 1977 which could account for some increase in ridership by persons in wheelchairs. First, the fare discount program became more widely known. It had been established only four months before the first set of counts was made in 1975. Second, the reliability of BART service improved, and some improvements to facilities for disabled persons were made. Some disabled persons may have felt more confident about using the system as a result. Third, hours of BART operations were extended from 8:00 p.m. to midnight. This may have encouraged travel by disabled persons, since many of them are not fully employed and it is therefore reasonable to expect much of their travel to take place in off-peak periods of service.

One further indication of the extent of BART use by disabled persons is the proportion of riders using transit discount tickets available to disabled persons. An on-board survey of BART patrons made by BART in May, 1977 indicates that about 1.4% of all patrons currently use such discount tickets.

Comparisons of the number of disabled persons using BART with the number of disabled persons in the Bay Area population are difficult to make because of the lack of current and comprehensive data showing the location and number of disabled persons. Two suggestive estimates are available:

BART ELEVATOR USE
IN 1975 AND 1977¹

STATION	Average Daily Elevator Use				Rate of Elevator Use Per 1000 Passenger Trips			
	1975 (November)		1977 (February)		Total Elevator Use		Wheelchair Elevator Use	
	Total	No. of Wheelchairs	Total	No. of Wheelchairs	1975	1977	1975	1977
Rockridge	2.3	1.2	9.7	.9	.61	2.31	.32	.21
Orinda	10.3	.2	8.9	.7	2.93	2.67	.06	.21
Lafayette	26.4	0	18.6	1.8	6.47	4.38	0	.42
Walnut Creek	4.2	1.9	25.7	2.7	.62	3.58	.28	.38
Pleasant Hill	11.0	3.0	17.9	2.1	1.78	2.53	.48	.30
Concord	29.5	3.9	17.0	0	3.51	1.87	.46	0
Concord Line Total	83.7	10.2	97.8	8.2	2.56	2.79	.31	.23
Ashby	4.2	.6	3.2	1.7	1.91	1.28	.27	.68
Berkeley	15.2	10.0	16.3	14.6	1.26	1.44	.83	1.29
No. Berkeley	1.9	1.5	5.4	2.2	.75	1.90	.59	.77
El Cerrito Plaza	2.2	.6	.8	.2	.71	.29	.20	.07
El Cerrito Del Norte	7.4	3.3	3.8	.3	1.88	.99	.84	.08
Richmond	7.0	1.6	24.8	1.2	2.36	8.18	.54	.40
Richmond Line Total	37.9	17.6	54.3	20.2	1.41	2.15	.66	.80
MacArthur	7.7	3.5	12.3	3.5	2.02	2.41	.92	.68
19th Street	6.7	--2	--2	--2	.57	--2	--2	--2
12th Street	--2	--2	--2	--2	--2	--2	--2	--2
Oakland West	5.3	--2	--2	--2	2.12	--2	--2	--2
Oakland Line Total	19.7	--	--	--	1.09	--	--	--
Lake Merritt	3.0	.9	14.9	5.9	.52	2.37	.16	.94
Fruitvale	8.7	.9	17.3	2.6	1.51	2.95	.16	.44
Coliseum	2.9	.5	3.7	.7	.77	.88	.13	.17
San Leandro	17.2	.3	13.5	1.0	3.95	3.03	.07	.22
Bay Fair	5.1	.4	10.7	2.7	.91	1.98	.07	.18
Hayward	12.2	2.7	16.1	4.5	1.77	2.32	.39	.65
So. Hayward	7.4	1.6	10.0	2.0	2.28	2.76	.49	.55
Union City	4.6	.4	9.6	0	1.11	1.97	.10	0
Fremont	11.0	1.4	34.5	3.1	1.54	4.90	.20	.44
Alameda Line Total	72.1	9.1	130.3	22.5	1.55	2.68	.20	.46
Embarcadero	--3	--3	5.8	3.0	--3	.30	--3	0
Montgomery	11.9	3.4	20.5	3.0	.29	.61	.08	.09
Powell	21.0	.1	34.4	1.2	1.02	1.66	.04	.06
Civic Center	1.4	.8	8.6	2.6	.11	.57	.07	.17
16th & Mission	18.4	.6	10.0	.9	5.65	2.26	.18	.20
24th & Mission	4.0	.7	24.5	2.0	.86	3.81	.15	.31
Glen Park	4.3	.2	7.2	0	.71	.99	.03	0
Balboa Park	8.1	1.3	11.3	0	1.20	1.25	.19	0
Daly City	26.0	.4	25.8	.4	1.82	1.58	.03	.02
San Francisco Line Total	95.1	7.5	148.1	13.1	.88	1.12	.07	.10
System Total	308.5	47.9	442.8	67.4	1.33	1.80	.22	.27

¹Counts were made during a two-week period in each year during the entire BART operating day. Each set of counts represents elevator, not patron, trips; even though more than one person might be using an elevator, the trip was counted as one. For this reason, the comparison of elevator usage to patronage somewhat understates the usage. Elevator counts do not necessarily show the extent of use by handicapped persons, since it is possible for any BART patron to use the elevator. Counts of the use of elevators by persons in wheelchairs do represent the number of persons, not the number of elevator trips. If two wheelchairs were in one elevator, two were tallied.

²Counts were not made at this station

³Station not open in 1975

- (1) Results of a National Health survey made by the National Center for Health Statistics in 1969 indicate that there is one person in a wheelchair for every 500 in the population of the 3-County BART District. The BART ratio of 1 patron trip in a wheelchair for every 3,700 patron trips appears low by comparison. However, it should be noted that severely disabled persons travel far less frequently than able-bodied persons, as discussed below. (Ref. 8, p. 145)
- (2) An estimate by the State of California Department of Rehabilitation indicates that 6.5% of the 18-64 age group in the 9-County Bay Area Region in 1970 had "disabled conditions." This estimate can be very roughly compared to the 1.4% of BART patrons using transit discount tickets for disabled persons since the categories of disabilities used to establish eligibility for the transit discount fare and those used for purposes of the survey overlap to a large extent. However, to evaluate the comparison one must consider the rate of mobility of disabled persons.

A recent estimate of mobility for persons over 5 years of age in the United States indicates that the average person made 15.5 one-way trips by motorized vehicles per week in 1969-72. A recent survey of persons who live in the East Bay area served by AC Transit indicates that disabled persons made 10.2 trips per week, over 1/3 less than able-bodied persons in the nation as a whole. Additionally, the survey indicates that the average number of one-way trips made by persons with severe disabilities is only 6.8 per week, less than half that of the general population. It should be noted that the average number of trips made by persons in the Bay Area is probably somewhat higher than that for persons in the country as a whole. Therefore the foregoing comparison tends to underestimate the difference in mobility between able-bodied and disabled persons in the Bay Area. (Ref. 1, p. 50)

The lack of comparability of surveys and travel rates in terms of their geographic base, the time period in which they were made, and their assumptions about the definition of disabilities make any attempts to demonstrate the extent to which BART serves disabled persons in the community extremely tenuous. The figures suggest that severely disabled persons make less than half the number of total trips that able-bodied persons make. Therefore, the fact that among BART patrons one trip in 3,700 is made in a wheelchair suggests that BART may be serving this group of patrons to the extent which might be expected, given limitations to the feeder service for them.

From the foregoing discussion, it can be reasonably concluded that the rate of use of BART by disabled persons is probably somewhat lower than the incidence of trips by disabled persons in the BART service area. The use of BART by disabled persons appears to be increasing, although the two data points available are for a limited kind of measure and they provide only suggestive evidence.

An important factor in disabled persons' use of BART or any other transportation system, and one which should be considered when measures of the use of a system are considered, has been described by one disabled person as a "range of mobility". "People who have been immobile for many years simply have no idea of the impact mobility can have on their lives. This lack of awareness is not simple ignorance. It is also a defense mechanism; knowledge of what mobility can mean can only be frustrating to persons who are immobile." (Ref. 4, p. 7) In other words, the use of a new transportation system involves a change in orientation, a new motivation, and the willingness to take risks on the part of disabled persons. It also involves the development of new connections at greater distances from home. A considerable length of time may be required for many disabled persons to become accustomed to a new transit system and to use it to extend their range of mobility.

Summary

The BART experience demonstrates that a transit system staff which has made a commitment to serve disabled persons well will find it necessary to plan for their travels at every step of design and modification of the system. All aspects of a transit system from the layout of stations to the content and design of its public information, from procedures for ticketing to the allocation of space for wheelchairs on vehicles affect the ability of disabled persons to use a transit system.

Several themes recur throughout the series of interviews with disabled persons. The need for better information both inside and outside BART stations and for better feeder service to and from stations are major concerns expressed by interviewees. Disabled persons also need safeguards against falling in trains or onto trackways, and from getting lost or disoriented within the system. Physical barriers to their use of the system are especially important impediments to their travel.

In addition, disabled persons have indicated that they want to travel as independently as possible. The fewer "checkpoints" at which a station agent or another passenger must be relied upon for security or for assistance, the better the trip for a disabled patron. Disabled persons also do not want to be in the way; several expressed embarrassment about blocking doors with a wheelchair. Their desire for independent use of BART is accompanied by a need for station agents to be knowledgeable about the kinds of problems a handicapped person is likely to encounter in the system, and to be capable of responding in case assistance is required.

Disabled persons who were interviewed suggested a number of improvements to the BART system which would assist their travels. Some have been or are being implemented at BART, as described previously. Some are the responsibility of city authorities or other transit agencies. Those most prominently mentioned are listed here for consideration by planners of transit systems which are intended to serve disabled persons.

1. Good connections between BART and local feeder services which are accessible to disabled persons are needed.
2. Local streets around stations should have curb cuts and stop lights to enable disabled persons to get to and from stations safely.

3. Wide dissemination of information about BART, its facilities, operations and services should be made to persons who are disabled.
4. Ticketing procedures which are as simple as possible are helpful to disabled persons.
5. All obstructions and edges of platforms should be enclosed or marked by warning strips which blind persons can detect.
6. Lightweight doors and gates throughout the system are important to disabled persons.
7. Push-pull motions are easier for many disabled persons than twisting or lifting motions. This principle should be kept in mind for the design of all mechanical equipment to be used by patrons. Intercommunication systems operated by push-buttons are better for use by disabled persons than telephones.
8. Accessible manual controls for elevators are desirable. Good communication from inside an elevator to a station agent is very helpful in giving disabled patrons a sense of security.
9. Out-of-the-way space for wheelchairs on a train is helpful.
10. A solution for problems arising from the gap between the train doors and station platforms should be sought.
11. The provision of stanchions, grab rails, and/or straps on transit vehicles is necessary to assist semi-ambulatory and elderly persons to keep their balance in a moving vehicle.
12. Good textured markings of routes through stations, and maps of station layouts near entrances and on station platforms would make a trip on BART more efficient for disabled persons as well as able-bodied patrons.
13. Braille signs or signs with raised letters and bas-relief maps are needed through the system for blind patrons. All announcements should be both audible and visible.
14. Transit engineers working with disabled persons should seek a method of securing wheelchairs in vehicles which quadraplegics can use.

Planners in other areas can also learn from the BART operating experience that mistakes and omissions in the early planning for facilities for handicapped persons are seldom easily or quickly remedied. The addition of elevators to BART stations after designs had been completed and after construction had begun was very costly and resulted in poorly-located facilities. Needs for signs, better maintenance, and better communications were evident during the initial period of the BART system operations. However, repairs were made and new equipment was provided very slowly. For instance, the decision to provide elevator signs, which was made three years ago, has not yet been implemented.

Action to improve the facilities has been slow because other needs for funds and staff time were far more pressing. When operations began at BART, major components such as the vehicles and the automatic train control equipment did not work reliably. Improvements to access facilities were assigned low priorities because the need to repair basic system-wide equipment was far more urgent. Only recently have major efforts by the BART Planning Department and the Task Force been successful in securing improvements which have resulted in some improvement to the performance of the special facilities.

Use of BART by disabled persons appears to be increasing. Some persons interviewed have said that BART makes some trips easier for them. Others have mentioned their fears of accidents or malfunctions as a deterrent to their use of the system. Improved BART reliability may encourage more use of the system by disabled persons.

Implications

The BART experience demonstrates that transportation planners and public officials can expect that the provision of service to disabled persons will require extensive allocations of time, money, and effort if the task is to be done well. They can also expect that the expenditure of resources is likely to be out of proportion to the extent of use of the system by disabled persons during the early years of the system's operations.

The BART experience also demonstrates that persons with severe disabilities can use a modern rail rapid transit system. Some disabled persons travel more often and with greater ease as a result of the provision of the BART access facilities. Other disabled persons do not use BART, and they give many reasons for not using it. Some say BART does not go to any of the places they wish to go. Some cite difficulties in getting to BART, and others difficulties with using the system. Some have fears and anxieties about equipment malfunctions or about the idea of an accident or disaster on the system.

The evidence of the extent of the use of BART by disabled persons and the comments of disabled persons who were interviewed suggest that the introduction of a new means of mobility for persons with severe disabilities will not change their patterns of travel immediately. A period of time is required for disabled persons to begin to enlarge their range of mobility. It is likely that disabled persons' use of a new facility will increase slowly over time.

The provision of accessible feeder services to a rail rapid transit system is an important ingredient in the over-all service to disabled persons. Curb cuts, accessible buses, reserved parking spaces near station entrances, and provisions for safe street crossings around stations are all important to disabled transit users.

The process of planning and modifying BART access facilities has benefitted from the advice of disabled persons. Transit planners elsewhere can learn from this aspect of the BART experience that the inclusion of disabled persons in the planning process from the time of its inception is desirable. Disabled persons can also assist transit agencies to disseminate information about the facilities which have been provided and to teach other disabled persons to use the transit system.

The provision of access facilities is a vital step in the process of making the urban environment accessible to disabled

persons. However, it is not sufficient, by itself, to change the patterns of living and attitudes of disabled persons and to create needs and desires for mobility. Employment, recreation, and social activities which create travel needs must become part of the lives of disabled persons before the use of transit will be important to them. Additionally, social and psychological barriers to entering the mainstream of community life must be overcome before disabled persons can be expected to make extensive use of the facilities of a public transit system.

The full extent of the impacts of the BART facilities for disabled persons cannot be examined until many changes occur in the physical and social environment to permit and encourage travel by disabled persons.

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APPENDIX I

THE SAN FRANCISCO BAY AREA RAPID TRANSIT FACILITIES FOR THE ELDERLY AND THE HANDICAPPED *

By Harold L. Willson

The San Francisco Bay Area Rapid Transit (BART) facilities for the elderly and handicapped surpass those of any other mass transportation system in the world by offering "100% ridership" accessibility for all persons who can move about in public places. These facilities, however, did not automatically result from the routine planning and consulting by the transportation planners, engineers, and other experts. These facilities, designed into this system at a cost of approximately \$8.5 million, are due mostly to my efforts through the architectural barrier committee of Easter Seal Society for Crippled Children and Adults, Alameda and Contra Costa counties.

The original BART system concept, as authorized by the public bond issue in 1962, did not include accessible facilities for people with severely restricted mobility. At that time, I initiated a campaign to secure the present facilities by joining with Easter Seal Society and by formulating plans and activities to achieve the objective of complete accessibility for each elderly and handicapped person, including the nonambulatory confined to a wheelchair.

In those days, with the absence of a strong support base from the handicapped as well as the very low public awareness of the architectural barrier problems and, more importantly, the absence of laws mandating a barrier free environment, the campaign thrust had to be based on the constitutional right -- public access to public property, etc. -- for each individual with a strong emphasis on an educational evolution employing a professional, pleasant, firm and persistent attitude.

The first efforts were to obtain endorsements from the elderly and handicapped and the general public. A variety of methods were used to obtain these endorsements and support for the project from a large number of individuals and organizations.

It was, of course, imperative that the strongest endorsement support should be obtained from the organizations interested in the welfare of the elderly and handicapped. Continual meetings with these organizations were necessary to trigger

*Edited by MTC for purpose of inclusion in this document.

letter campaigns to BART and the State legislature. However, to obtain the support of the general public, many of my evenings especially in the early years of the project were devoted to speaking engagements at service, church, professional, and civic groups. Thus the project was not "sold" to the public with fanfare and publicity but by person-to-person contacts.

Due to the very low public awareness of the architectural barrier problems, my person-to-person "sell" concept with the BART Board of Directors and staff was very beneficial because these frank discussions served to alleviate the awkward problem of objective evaluation of the problems, and there were many. After all, an unfavorable decision toward the elderly and handicapped could be interpreted by some as a vote against mother, flag, country, and apple pie.

Even so, the education evolution concept is a slow and painstaking method, especially when the BART Board of Directors and staff at first was not convinced that providing for the severely mobility limited was advisable. The necessity and extent of special facilities needed was understandably new to BART officials because all of the existing public transportation systems presented virtually insurmountable barriers to the elderly and handicapped. Educating them to new concepts took statistics and "friendly persuasion" such as pointing out BART's responsibility to provide transportation to all of the public.

I put in many hours at BART in meetings and with individual officials to convince them that they need not be overly protective toward the mobility limited individuals. The message was that elderly and handicapped should not be denied public access in the name of cost, protection, or personal safety. Rather, the mobility limited and BART must seek and reach a balance of responsibilities. I pointed out that BART must provide reasonable and complete access for the elderly and the handicapped and, in turn, the mobility limited must be capable of functioning in the public sector with a sufficient degree of competence and assurances such as using a properly equipped wheelchair, etc. After that, handicapped persons should gladly take a reasonable risk in exchange for mobility because adequate transportation is often the deciding factor between being dependent upon society or family and being independent within society.

Nonetheless, detailed discussions of the problems, some emotional, some objective, and some non-existent inventions, were inevitable because, as one engineer stated, "more than 30 stations located in 3 counties and in 15 communities will have to be designed with wheelchairs in mind at every turn." I interpreted this statement as saying, if BART opens the door

to the severely mobility limited, then there are no halfway measures -- it's all or nothing at all. (Due to the BART experience, this engineer, Mr. A. E. Wolf, is now one of the handicapped's best friends.)

The detailed discussions dwelled on such topics as: What if there is a power failure? What if a train develops mechanical trouble or there is a fire? Will these individuals be safeguarded during fast acceleration or deceleration? How will these individuals arrive at BART and arrive at their destination after leaving BART's station? Will the other passengers' safety be impeded by these individuals? Wouldn't it be cheaper and safer to transport these individuals by taxi? How many and what is the location of these elderly and handicapped? How many will use BART?

Further, we discussed the concepts of a one-shot survey to locate and identify the elderly and the handicapped. I pointed out that one-shot surveys and counts are irrelevant to the barrier free environment issue and, in fact, these small number and half-hearted solutions tend to promote programs that will isolate the elderly and handicapped into high operational cost facilities and segregated inadequate public transportation systems. Important factors to consider are that:

1. The average life expectancy has increased to approximately 70 years of age, and more lives that would otherwise have been lost have been saved through the use of new drugs, such as antibiotics and new medical innovations.
2. According to the national health survey, 49 out of 100 persons age 65 and over are limited in mobility due to at least one chronic physical condition, and
3. It was in 1938 that the first antibiotic drug was used in this country and it is safe to assume that the full cycle effect of this first antibiotic drug has not fully materialized.

Furthermore, new drugs, derivatives thereof, as well as new medical innovations and therapy since 1938, additionally affect the full life cycle. Conclusions reached --

1. It is safe to assume that the number of elderly and handicapped persons of today does not reflect the true picture of tomorrow and considering the lag time

in life factors in the planning and acquisition of capital goods, one-shot surveys of numbers and locations of the handicapped are next to worthless.

2. If an individual only lives to middle age, the probabilities are very high that the person will be handicapped, and the longer the individual lives, the greater the odds become. It is only the degree of immobility and/or the degree of permanence left to be determined, and
3. Regardless of race, creed, color, wealth, etc. no one has a guarantee that they will not be handicapped. Since each one of us will require a barrier free environment, let each one of us assume the positive attitude toward the achievement of a barrier free environment posthaste and forget this nonsense of today's numbers.

Finally, in 1965 the BART policy to provide for the severely mobility limited began to be regarded favorably with the staff being directed to provide the space for the future installation of elevators in all subway stations. The major breakdown came on leap year day, 1968, when the BART Board of Directors adopted the policy that it would inform all concerned that the facilities for the elderly and the handicapped would require an estimated additional \$5 to \$7 million dollars (later revised to nearly \$10 million), and that the State legislature should be notified that the BART District would be willing to install the facilities if the additional money were provided from sources other than the BART district. Since the facilities for the elderly and handicapped were omitted in the original plans and thereby omitted in the bond issue, this policy was the best policy the severely mobility limited could expect from BART.

Once BART was convinced, construction policy was changed and BART provided the estimated cost data. Our (BART's and mine) final objective was to secure authority and funds for these facilities from the State Legislature. This authority was accomplished through the enactment of the landmark Assembly bill #7, Chapter 261, which was signed by Governor Ronald Reagan on June 6, 1968. The basic provision of the law is as follows:

"...it is the purpose of this Chapter to insure that buildings and facilities, constructed in this State by use of State, County, or municipal funds, or funds of any political

subdivision of this State adhere to the American Standards Association specifications A117.1 -- 1960 for making buildings and facilities accessible to and usable by physically handicapped..."

This law was not directed specifically at BART but rather for all future construction of public buildings. Its passage required a massive state-wide effort by many elderly and handicapped groups and individuals with individuals of the Easter Seal Society spearheading the effort.

A few months later, the State Legislature resolved BART's "funds to complete" shortage problems and specified funds for the elderly and handicapped facilities through the $\frac{1}{2}\%$ sales tax increase, and not from the Urban Mass Transportation Administration, Washington, D.C. Needless to say, many hours were spent with the State legislators to convince them that BART should also be designed for this special segment of the population.

In July, 1969, after the Architectural Barrier Committee law was in effect and after the funds to provide the accessible facilities in all stations were supplied through the $\frac{1}{2}\%$ sales tax increase, the PBTB, BART's contractor, recommended that the Board reconsider its decision to include elevators in all stations and that the Board provide a skip-station elevator installation program in the suburban-type areas. This recommendation was based on a variety of reasons. For instance, a number of the engineers and architects truly believed the installation of elevators in each and every station was impractical financially and that utilization would not warrant the service.

I recommended the program because it became obvious that if the skip-station resolution was not adopted, then the entire project would be sidetracked and returned to committee. Since construction and retrofit timing were crucial and the return to the committee delay would cause an increase of cost attributable to additional retrofit requirements and inflation, I recommended an adoption of a resolution to immediately commence the necessary procedures for the 24 unquestioned stations and return the 10 questionable stations back to committee until such time as the legal council could determine the impact of the new state law. I was certain that this question would be cleared up quickly -- three or four months -- through political and/or legal support. Needless to say, elevators were installed in each and every BART station.

During the closing month of the construction phase, I continued to assist BART in facility inspections, special training for public contact personnel, and with printing guides

for the elderly and handicapped. Within the last few years a formal Task Force committee for the elderly and handicapped was formed and supported by BART. The committee membership consists of BART staff, representatives from the public and private agencies, and handicapped individuals. The discount fare program for all of the transportation districts in the San Francisco Bay Area came from this task force. Monthly meetings are convened and chaired by Barbara Neustadter, BART Planning Department. The goal of the task force is to improve facilities and the operation of the facilities to maintain efficient, convenient, and comfortable transportation service to the elderly and handicapped.

I take a special personal pride in being the first handicapped person in a wheelchair to use a subway train and to again represent all handicapped travelers who will use the BART system in years to come. I will never forget the sense of freedom that I experienced as I boarded the BART train.

Here in the San Francisco Bay Area, in other parts of the country and on the international scene, the effectiveness of the facilities and BART's impact on the mobility of handicapped persons has been and is continuing to improve. After all, the "100% ridership" success project of the BART magnitude can not be denied. The BART project for the elderly and the handicapped had a direct effect on the subway systems now under construction in Washington D.C., Baltimore Maryland, and Atlanta Georgia, for these systems will provide for the wheelchair passenger.

At this time a rational evaluation of the BART impact on the mobility of the elderly and handicapped here in the San Francisco Bay Area is most difficult if not impossible due to the variety of factors. A number, but not all, of these factors are as follows:

1. The BART evening service is less than one year old and the weekend service is nonexistent. Since most of the elderly and many of the handicapped are unemployed, their transportation service requirements would most likely occur during the evening and/or weekend.
2. Also, since many of the handicapped are unemployed, the commute service requirements are reduced in comparison to the nonhandicapped work force requirements. A long-term positive commitment to service for the handicapped coupled with a successful affirmative action program for employment of the handicapped should have a direct influence on the mobility impact for these individuals.

3. Adequate feeder service to and from BART by the public transit district is nonexistent which has caused the greatest negative impact on the BART facilities for the handicapped. Even though it has been eight years since the BART board of directors adopted a policy to provide accessible facilities for the handicapped and it has been six years since Section 16 of the Urban Mass Transit Act was mandated by law, the transit industry is just beginning to seriously address itself to the resolution of the problems associated with providing services for the handicapped.
4. The BART service reliability acceptance by the public is below norm. Even though the service is improving, a number of the elderly and handicapped have yet to utilize BART because of the fear that if BART fails, they would be stranded.
5. Handicapped persons who own two automobiles or have other transportation arrangements are not necessarily expected to discard the economic value of their present transportation system to use BART, especially since adequate feeder services are nonexistent.
6. Careful measurements and evaluations of BART patronage by the elderly and handicapped have not been made.

The BART utilization by handicapped persons has increased as evidenced by the BART elevator use reports. Furthermore, now that an exerted effort is being made to develop wheelchair lifts for buses as well as for the San Francisco light rail system, an adequate and integrated barrier-free transportation environment for the San Francisco Bay Area could be just a few short years away. This is in part attributable to the impact of the facilities for the handicapped at BART.

The momentum of the educational campaign is greatest outside of the transportation industry because, in my opinion, progress is slow in such entrenched organizations as public transportation. However, success is on its way. The Urban Mass Transportation Administration has become more and more aware of the real problems of the elderly and handicapped, and of the need to provide service for them. Laws are being enacted to resolve these problems and technical equipment problems such as those involved in improved wheelchair lifts are being resolved.

An illustration of the commitment is that, six years after the enactment of Section 16 of the Urban Mass Transportation Act, rules and regulations to provide transportation services for the elderly and handicapped have been adopted by UMTA. Even though these include some weaknesses and vague waivers, the new rules and regulations are a positive step forward in our

never ending efforts to establish an adequate barrier-free transportation environment. It should be noted that these rules and regulations require all fixed facilities designed, constructed, or altered on or after May 31, 1976 and all new rapid rail vehicles to be accessible to the handicapped, including the wheelchair passenger. This is a direct impact of the successful BART project. Furthermore, other sections of the rules and regulations were directly and/or indirectly attributable to the BART facilities and their long-term commitment to resolve the transportation problem for the elderly and the handicapped.

Further, planning and law compliance advisory committees are inviting handicapped persons to help resolve these problems, and I think the success of the BART project was a direct influence in part on all these improvements.

Outside of the transportation industry the momentum is very strong, again due in part directly to the influence of the success of the BART project. My involvement alone has included participating in many university seminars, writing articles for local, national and international publications, membership on boards of directors for health agencies and committees attentive to resolving the problems for the handicapped, testifying at local, state, and national legislative committee meetings, giving presentations to local and national organizations of handicapped groups, membership on consumer affairs and citizens' advisory committees, and participating in local, national, and international news and/or documentary films.

Once the industry has complied with the UMTA regulations and the long-term commitment to the spirit of the laws and constitutional rights we will have efficient, adequate, convenient, and comfortable integrated public transportation for one and all, including the nonambulatory, elderly and handicapped.

The deeper the transit industry relies on public tax money for capital and operating funds, the more the public, especially the wheelchair passenger, must be assured adequate public transportation. The safeguard of constitutional rights for the individual and the creation of the barrier free transportation environment should be a paramount issue for the industry public and private agencies and the handicapped.

I have heard reasonable individuals state that we must find reasonable solutions to the problems of access to buildings and public transportation for the elderly and the handicapped. I hope these individuals do not mean that we must find cheap, inadequate, and tokenism solutions that will lead to segregated transportation systems and ghettos for the elderly and the handicapped. The one lesson from our heritage and history is

that segregation for whatever reason is unacceptable. Our nation has one busing problem due to the segregation of the races. Why should we knowingly create another busing problem over segregation of the elderly and handicapped?

No matter how much effort is required, we must correct our transportation goof and create a barrier free transportation environment for those that are handicapped and for all of us, because many of us are destined to become disabled.

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Appendix II

Annotated Bibliography of Studies Summarized for this Report

The studies which are the basis of information presented in this report were prepared under contract to the BART Impact Program, a comprehensive study and evaluation of the impacts of the BART system in the Bay Area which is being conducted by the Metropolitan Transportation Commission (MTC). The Impact Program is funded by the U.S. Department of Transportation and the U.S. Department of Housing and Urban Development.

1. BART and the Handicapped by Robert Levine
Document #WP12-17, prepared by MTC for the U.S. Department of Transportation

Part I of this study is a detailed history of the decision process which produced facilities for disabled persons in the BART system. It is based on BART records and on interviews with disabled persons and with BART staff members who participated in the decision process. Part II is an evaluation of the facilities made by a study team composed of MTC staff and disabled persons from the Center of Independent Living in Berkeley, which is a non-profit organization founded and staffed by persons with severe disabilities. The Center provides services such as mobility training, counseling, transportation, and housing and attendant referral services. The study team included six persons, five of whom were disabled. Two of the disabled persons were in wheelchairs, one used a leg brace, one was blind, and one used crutches. The observations were made in the fall of 1974.

2. Environmental Impacts of BART: Community Monitoring, Phase II
by Curtis Associates
Document #WP 22-4-76, prepared for the BART Impact Program, Berkeley, California, March, 1976.

This study reports results of telephone interviews conducted with disabled BART patrons during 1976. The sample of interviewees was drawn from a list of disabled persons who had obtained discount cards for transit use in the Bay Area. The purpose was to obtain a cross-section of disabled persons' views about BART rather than to provide a statistically reliable sample. Eighteen disabled persons were interviewed. Six had vision problems, two were mentally retarded, five had heart conditions, four were semi-ambulatory, and one was in a wheelchair.

3. Environmental Impacts of BART: The User's Experience by
De Leuw Cather & Co.

Technical Memorandum in publication by the Metropolitan
Transportation Commission for U.S. Department of Transpor-
tation

A staff member for this study observed and evaluated facili-
ties for disabled persons throughout the BART system in 1976.
His observations are included in this report.

4. "Special Group Mobility Survey and Analysis" by Jefferson
Associates in conjunction with the Center for Independent
Living

Unpublished study for the BART Impact Program, November,
1975.

Results of interviews with 43 persons in the spring of 1975
are summarized in this study. Twenty of the persons inter-
viewed described themselves as BART users; five had used BART
only once, and eighteen had not travelled on the system. The
sample of persons to be interviewed was drawn from the Center
for Independent Living mailing list and included only persons
whose names were listed in local telephone directories. Both
circumstances bias the results toward persons who are active,
mobile, and independent. A large proportion of the persons
affiliated with the Center for Independent Living live in the
central Berkeley area near the University of California campus.
Both the University and the Center provide transportation, hous-
ing, attendant, and counseling services for disabled persons.
Therefore the Berkeley area attracts disabled persons who are
students, who are politically and socially active, and who main-
tain a relatively high rate of activity because of the support
and encouragement of organizations of persons in the area.
Therefore the sample is not statistically representative but it
does include persons with a wide variety of physical disabilities.

Because of the limitations of the samples of persons inter-
viewed all observations described in this report are intended
to be descriptive rather than quantitative.

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